A Financial Analysis of Domestic Firms With Highest Returns to Capital During the Worldwide Pandemic

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This study analyzes the financial profile and risk-performance characteristics for the group of firms reporting the highest returns to total capital in the Value Line database during the worldwide pandemic. It compares the firms with a group selected randomly from the same industries to investigate if the firms reporting high returns to capital in such unusual economic environment have a unique risk-performance profile. This study tests if the group with the highest returns has a unique financial profile, and can the findings be validated without bias. If the answer is "yes," then it would imply the financial profile may be used as a tool to predict if a particular company will maintain extraordinary performance in periods with similar market disturbances. As this study uses a new tool to analyze the financial characteristics of companies, it is a significant addition to the growing body of knowledge. Moreover, the tool used can also be applied by financial researchers, investors, and investment advisors/counselors in determining firm's inherent values in such a unique environment.

Keywords: coronavirus pandemic, total capital, multiple discriminant analysis

INTRODUCTION

The consequences of the coronavirus pandemic of the year 2020 in the United States are not unlike the rest of the world. Those effects have resulted in increased unemployment, business closings, loss of properties, loss of individual wealth, disruption of supply chains, illness, despair, and death. The literature is replete with endless stories of hardships, suffering and small business bankruptcies caused by the virus. Those events continued at the time of this writing and those conditions are expected to continue until possibly "herd immunity" is established through effective vaccines and natural immunity.

Logic seems to point to the conclusion that, in such an ambiguous environment, pessimism would prevail and that invested capital and returns on total capital would certainly lessen. However, the opposite has been true and continues to be true. As with any other market, companies in the U.S. are not homogeneous with regard to business variables including returns on invested capital. Thus, regardless of

the pandemic and its terrible broad and extensive consequences, The *Value Line* database identifies many companies that have achieved extra-ordinary performance during this unequivocal period. Those companies are the subject of this investigation and are compared with companies chosen randomly from the *Value Line* database from the same industries. The intent is to determine if the firms with the superior performance to total capital have a unique identifiable profile.

The purpose of this study is to establish a financial profile for the firms identified in Value Line database as experiencing the highest returns to total capital during the pandemic period and to compare that profile with a group of randomly selected firms from the same industries. More specifically, the study is concerned with those variables that are indicators of the firm's risk-return tradeoff personality. If results indicate that the group reporting the highest returns to total capital have a unique financial profile and the test is statistically unbiased, it will imply that the unique profile could be used to make predictions about the companies that would maintain high returns to capital in the future in a similar disturbing environment. Previous studies have analyzed those variables using multiple discriminant analysis and used canonical correlation to rank those firms. However, this new tool would aid to the analysis of the financial characteristics of those firms reporting the highest returns to total capital during a pandemic or similar disturbance and would be a significant addition to the growing body of knowledge of how a pandemic can affect businesses and thereby the entire economy. This new tool would help financial researchers, investors, and investment advisors/counselors in determining firms' intrinsic values in such an environment.

REVIEW OF LITERATURE

Empirical studies indicate that the accuracy of the *Value Line* reports and rankings have been exceptional. For example, stocks top-ranked by the financial service based on risk-adjusted performance have outperformed the Dow Jones Wilshire 5000's total-return index by an average of 2.6 percent for over thirty years (Hulbert, 2007). The Value Line reports and other Value Line information, although widely used, are contrary to the position underlying the Efficient Market Hypothesis (EMH). Such an extraordinary performance of Value Line reports and information has led many to refer to it as the *Value Line* Anomaly or the *Value Line* Enigma. Fischer Black, one of the proponents of the EMH, once claimed *Value Line's* results to be the big exception to the EMH (Swedroe, 2010). Huang (2017), in his study using data since 1931 and polling advisers, professional stockbrokers, and bond specialists tried to find the best investing tools, newsletters, websites, and journals for potential investors. He concluded that *Value Line* was the most reliable and outperforming source of stock investment research, especially for risk-adjusted-performance.

Damodaran (2014), however, suggests that the Value Line rankings for return on total capital should only be used in conjunction with risk analysis and timing data rather than in isolation. His study further opined that many traders, in their trading systems, fail to incorporate sound risk management techniques when using the Value Line report (Damodaran (2014). Another study by Castater, Workman, and Payne (2020) found that the return on capital is rarely used in isolation in the evaluation of investments and is used in conjunction with *Value Line's* Timeliness rating and argue that the two ratings should be consistent. Lockwood, Zhang, and Le (2016), found that the high success of the Value Line rankings is confined to U.S. stocks. They conclude that U.S. listed stocks significantly outperform their benchmarks long after the change in *Value Line's* ranking is announced and found no evidence of a *Value Line* effect for recommendations in case of foreign stocks listed in U.S. exchanges or those listed outside the U.S.

This study, therefore, contributes substantially to the existing body of knowledge in the field as it also takes into account the macroeconomic aspect at the time company rankings is awarded, the one that was ignored by previous studies. This is because, this study also examines the companies and their rankings for the year preceding this study, that saw the economic downturn of 2020 due to COVID-19 characterized by high unemployment, business closings, property loss, individual wealth loss, and disruption of global supply chains. The findings and conclusions of this study very well apply to the market conditions prevailing during a pandemic. However, caution should be used in extrapolating the findings of this study to normal, rising, or declining markets. Moreover, current literature has not explored the fundamental risk-return characteristics of the firms at the time the returns were reported. For that reason also, this study

significantly contributes to the existing body of knowledge of *Value Line's* reports and it does so to the extent that the *Value Line* reports are consistent with other financial services and reports of return on invested capital during a pandemic. Financial data collected as well as managerial responses observed during this period are evidence of the financial characteristics of firms and managerial responses during an economic downturn characterized by a pandemic. Thus, the one-year period starting January 2020 provides a guidance to the study of *Value Line*'s reports of returns to capital invested as well as the financial characteristics of firms ranked highest for returns on invested capital during this pandemic and economic recession.

METHODOLOGY

First, we have to consider the issue of classification of firms and then determine if the classification is statistically accurate. Specifically, it must be determined if firms can be assigned to one of two groups based on selected financial variables: (1) firms earning the highest returns (best performance) to total capital during a worldwide pandemic are referred to as (HRTC) or (2) firms selected randomly from within the same industries as the first group (FSR). Multiple discriminant analysis (MDA) effectively assigns firms to predetermined groupings on the basis of the attributes whose value depends on the group the firm actually belongs to. Canonical correlation analysis is performed to rank those variables based on their weighted effects on the results of the analysis. If the purpose of the study is to simply establish a financial profile of each group, then a simple ratio analysis is satisfactory. In 1968, Altman (1968), in his seminal paper, demonstrated that sets of variables that are used in multivariate analysis could be better descriptors of the firms and had more predictive power than those used in univariate tests. Therefore, MDA with a simultaneous evaluation is applied to accomplish the purpose of this study.

MDA is widely popular in social sciences for classification purposes. It is more commonly applied when the predictive variables are measured metrically while the dependent variables are measured nominally or ordinally. While Altman used MDA to predict corporate bankruptcy, other studies applied this methodology to analyze financially distressed property-liability insurance firms (Trieschmann and Pinches 1973) , to determine value through timing (Payne and Tyler 2020), and to identify causes of the failure of small businesses (Edmister 1982). For this study, both nominally measured dependent variables and metrically measured predictive variables are considered. In this study, nominally measured dependent variables are the group of HRTC firms and the group of FRS firms. The analysis applied the Discriminant Analysis feature in SPSS 20. As the objective, of this investigation, was to determine the discriminating capabilities of the entire set of variables and avoiding the influence of individual variables, all variables were considered in the model simultaneously. Since the purpose of the study was to identify the predictive power of the entire set of independent variables rather than any one variable (Hair et al. 1992), this method was appropriate.

Data used in this research were extracted from *Value Line Ratings and Reports*. The sample selected for this study falls in one of two groups: (a) the first group is the group of firms reporting the highest returns to total capital called, HRTC and (b) the second group is the group of firms randomly selected from within the same industries called, FRS. Our sample contains 348 observations from the first group and 342 observations from the second group for a total of 690 firms.

During the cycle of economic growth, economic decline, or a worldwide pandemic, industries experience varying effects, some adverse and some beneficial. To maintain the effects to industry constant to ensure an unbiased study, the companies in the HRTC group were matched with companies from the same industry in the FRS group. For example, in the restaurant industry, while Shake Shack falls in the HRTC group, EACO Corporation falls in the FRS group. Similarly, in the drugs industry, while Enzon Incorporated falls in the HRTC group, Olema Pharmaceuticals falls in the FRS group. Further, in food processing industry, Beyond Meat falls in the HRTC group but Kraft-Heinz falls in the FRS group. Similarly, in internet industry, while Cyngergis Tek comes under the HRTC group, Facebook Incorporated comes under the FRS group. Moreover, in the Banking industry, while Silvergate incorporated comes under the HRTC group, Boston Holdings, on the other hand, comes under the FRS group. This process matches each company reporting high returns to total

capital based on *Value Line* with a company randomly chosen from within the same industry, thereby eliminating any possible bias stemming from differences in industry listings.

While previous research and studies used various statistical methods to choose explanatory variables, this study used the following: one measure of the timeliness of potential investment in the firm, one measure of financial strength, two measures of risk, one measure of price performance, one measure of investors' perception of the firm, and one measure of potential growth. In equilibrium, the market value of both equity and debt is established by the buying and selling by the investors at the margin. Those two measures are essential for the success of this study. The explanatory variables are listed below:

X_1: *It ranks a stock's probable market performance one year in advance based on Value Line timeliness. The rank ranges from 1 to 5, with 5 being the highest for performance potential as derived by Value Line via a proprietary program that uses, as its inputs, a stock's price and earnings history, its recent price and earnings momentum, and its earnings surprises.*

X2: *It is the Value Line measure of financial strength of a firm.*

X3: *It is referred to as Hamada's Unlevered Beta and measures both financial risk and operating risk a company may undergo. First the Sharpe's beta coefficient is computed, which is used to measure the combined effect of both operating and financial risk. Then Hamada's (1972) equation is used to split the beta coefficient into two. The unlevered beta resulting from the split using the Hamada's equation is used to measure the operating or business risk resulting from operating costs. Similarly, the debt to total capital ratio is used to measure the financial risk (Van Horne 2001, Brigham and Daves, 2018).*

X4: *It is the long-term debt-to-capital ratio and measures the financial risk by recognizing if the firm is financed by creditors or by the owners.*

X5: *It is the annual percentage change in the price of the stock and is used as a general measure for change in value, which is a function of performance and the market's indicator of the performance of the stock.*

X6: *It is referred to as the price earnings multiple and is a measure of the market's perception of the value of the company as well as the quality of the company's reported earnings.*

X7: *It measures the two-year forecasted sales growth rate and has been found very appealing to investors (Kupper 2016).*

In the presence of a large number of potential independent variables, the general and prudent approach is to use the smallest possible number of variables accounting for a sufficiently large portion of the discrimination procedure (Zaiontz, 2014), which entails to only use the variables that logically serve the purpose of the study (Suozzo, 2001). Therefore, we only used the set of explanatory variables that are relevant for the purpose of building a financial profile for the HRTC firms. If our model turns out to be statistically unbiased, it will suggest that the financial profile of the HRTC firms can be used as a tool to forecast which companies will maintain high rates of return on their invested capital in markets hit by a pandemic or similar disturbances in the future.

TESTS AND RESULTS

The discriminant function is laid out as:

$$Z_j = C + V_1X_{1j}+V_2X_{2j}+.....+V_nX_{nj} \quad (1)$$

where C_0 is a constant, X_{ij} is the j^{th} firm's value for the i^{th} independent variable, V_i is the discriminant coefficient for each j^{th} firm's i^{th} variable, and Z_j is the j^{th} individual's discriminant score.
The following is the estimated version of equation (1).

$$Z_j = - .522 - .239X_1 - .295X_2 - .445X_3 + .0.001X_4 + .009X_5 + .024X_6 - .004X_7 \quad (2)$$

Using the above estimated equation, the Z-score for each firm has been calculated. Firms with a Z-score less than the critical value have been placed in group two (FRS) and the ones with a Z-score greater than the critical value in group one (HRTC). Since the two groups are heterogeneous, all HRTC firms are expected to fall into one group and all FRS firms into the other. Then we interpret the results of discriminant analysis by addressing the following questions:

- Question-1: Is the difference between the mean of the vectors of explanatory variables for the two groups statistically significant?
- Question-2: Did the discriminant function perform well?
- Question-3: Are the independent variables statistically significant?
- Question-4: Can this function discriminate equally well on any random sample as it did on the original sample?

The analysis uses Wilk's Lambda – a Chi-square transformation (Sharma 1996) generated by SPSS to answer the first question. The Chi-square value generated by the data in our study is 118.21 and exceeds the critical value of 14.07 at five percent significance level with 7 degrees of freedom. This prompted us to reject the null hypothesis of no significant difference between the financial profiles of the two groups, which led us to the conclusion that the two groups did have significantly different financial characteristics (please refer to Appendix A for a complete explanation). This result was as expected. Thus, the discriminant function does have the power to separate the two groups. Next, it is necessary to determine the percentage of firms that were classified correctly and if that percentage was statistically significant leading to the second question.

To address the second question a test of proportion is performed. The findings were out of 690 firms included in the sample, 465 were accurately classified between the two groups (i.e., HRTC and FRS), with a success rate of 67.4 percent. Table 1 below shows the detailed results.

TABLE 1
HRTC – FRS CLASSIFICATION

Actual Results	**Predicted Results**	
	HRTC	**FRS**
HRTC	244	104
FRS	121	221

A Press's Q-test that has a X^2-distiribution was performed to determine if the classification success rate of 67.4 is statistically significant. The test statistic is computed as:

$$\text{Press's } Q = [N-(n \times k)]^2/N(k-1) \quad (3)$$

where, N is the number of firms included in the study defined as the sample size, n is the number of firms correctly classified, and k is the number of groups included in the study.

The results show:

$$\text{Press's } Q = [690 - (465 \times 2)]^2 / [690\ (2-1)] = -1252.47 \quad (4)$$

Since the absolute value of Press's Q is greater than the critical value of X^2 with one degree of freedom at 5% significance level, we reject the null hypothesis that the percentage classified correctly is not significantly different from what would be classified correctly by chance. The finding is that the discriminant function did perform very well in separating the two groups.

The sign of estimated coefficients was investigated to answer question three. A positive sign would indicate that the higher a firm's value for the variable, the more likely it was to fall in group one (the HRTC group). Conversely, a negative sign would indicate that the higher a firm's value (in absolute term) for that variable, the more likely it was to fall in group two (the FRS group). In terms of the results as shown in Table 2, the greater the canonical coefficients of financial strength, the price-earnings multiple, one-year percentage change in price, and the measure of financial leverage, the more likely the firm to be classified as having high returns to total capital. On the other hand, the higher the timeliness ratings, the value for Hamada's unlevered beta and two-year growth rate the more likely the firm to report low returns to invested capital.

The relative contribution of each variable to the total discriminating power of the function is indicated by the discriminant loadings, which SPSS reports as the pooled within-groups correlations between discriminating variables and canonical function coefficients shown in the structure matrix. These are canonical correlation coefficients that measure the simple correlation between each independent variable, whose value lies between +1 and -1. Multicollinearity has little effect on the stability of canonical correlation coefficients (Sharma, 1996) unlike in case of a regression coefficient. An absolute value of the loading closer to 1 implies the stronger relationship between the discriminating variable and the dependent groups. The results on discriminant loadings with their rankings as produced by the SPSS-25.0 are shown in Table 2 below.

TABLE 2
RELATIVE CONTRIBUTION OF THE VARIABLES

Discriminant Variables	Coefficient	Rank
Financial Strength	0.906	1
Rank for Timeliness	-0.339	2
Unlevered Beta (Operating Leverage)	-0.191	3
Price-Earnings Multiple	0.166	4
Percentage Price Change	0.130	5
Debt to Total Capital (Financial Leverage)	0.087	6
The Two-Year Forecast Growth Rate	-0.076	7

Table 2 shows financial strength has the largest contribution to the overall discriminating function followed by Value Line's measure of timeliness, Hamada's unlevered beta, the price-earnings multiple, one-year percentage price change, the ratio of long-term debt to total capital, and the two-year forecasted growth rate respectively. Although some multicollinearity may exist between the predictive variables in the discriminant function, Hair et al, (1992), however, maintains that this is critical in stepwise analysis and may be a factor in determining the variables to be included in a model. But multicollinearity is less of a problem if all variables are entered in the model simultaneously, because the discriminatory power of the model is a function of the variables evaluated as a set. Moreover, explanatory variables in this study have been ranked based on the canonical correlation coefficients which are unaffected by multicollinearity (Sharma, 1996).

VALIDATION OF THE MODEL

Before any conclusions can be stated, it is important that if the model produce similar and valid results for any group of randomly drawn firms. For this, the Jacknife method is applied, which repeatedly fits the discriminant function to the samples drawn from the original sample. This procedure estimates (k–1)

number of samples eliminating one observation (firm) each time from the original sample of k-number of firms (Hair et al. 1992). This is because the assumption underlying this method is that the proportion of firms classified correctly by the jackknife method would be less than that in the original sample due to the systematic bias stemming from the sampling errors. In this study, the validation test in case of 6 firms only differs from the original test. So, the next issue was whether the proportion classified correctly by the validation test differed significantly from the correct classification of 67.4 percent in the original test. Simply, is the difference due to bias, and if so, is that bias statistically significant? Since there are only two samples for analysis, the statistical significance can be determined by applying the binomial test using the t-statistic as following:

$$t = (r - n\,p) / [n\,p\,q]^{½} \quad (5)$$

where, t is the calculated t-statistic, r is the number of cases classified correctly in the validation test, n is the sample size, p is the probability of a company being classified correctly in the original test, and q is the probability that a firm would be misclassified in the original test.

Our results found:

$$t = (460 - 690\,(0.674)) / [690\,(0.674)\,(0.326)]^{½} = -0.41 \quad (6)$$

Since the absolute value of the calculated t-statistic is less than its critical value of 1.645 at 5%, we cannot reject the null hypothesis of no significant difference between the proportion of firms classified correctly in the original test and the proportion classified correctly in the validation test. This finding leads us to the conclusion that if there were a bias in the original analysis, it would be statistically insignificant. So, the procedure would classify new firms equally well as it did in the original analysis.

In addition to applying the above validation procedure, researchers usually also test the equality of matrices that is important in the studies involving a disparity in the size of the groups. However, no such disparity was appeared in this study as one group had 348 observations while the other had 342 observations. One of the assumptions of MDA is that the variance-covariance matrices of the two groups must be equal. To test this equality, we used the Box's M-statistic, which is a parametric test and has an F-distribution. The results found the Box's M-statistic to be 369.55 at zero level of significance. Thus, one cannot reject the null hypothesis of the equality of the two matrices.

SUMMARY AND CONCLUSION

This study established a financial profile of risk-return characteristics for a group of firms having the highest risk-adjusted return to total capital in *Value Line* database during the worldwide pandemic. In order to determine whether the firms have a unique risk-return profile that reported high returns to total capital in such an economic environment, we compared those firms to the firms that were randomly selected from the same industries as the first group. While previous studies examining the fundamental characteristics of the firms that reported the highest returns to total capital ignored the macroeconomic fundamentals as well as the conditions in financial markets at the time the ratings were awarded, the data we used in this study were gathered during a worldwide pandemic featured by increased unemployment, business closings, property loss, loss of individual wealth, disruption of supply chains, illness, and death. The study discovered a unique set of explanatory variables for the firms reporting high returns to total capital. Findings of this study show that there was a significant difference in the financial profiles of the two groups of firms, which is confirmed by the signs of the adjusted coefficients presented in Table 2. In such analysis, while a positive sign implies that the greater a firm's value for the variable, the more likely it is to fall in group one (the HRTC group), a negative sign, on the other hand, implies that the greater a firm's value for that variable, the more likely it is to fall in group two (the FRS group). In terms of the output shown in Table 2, for firms with greater canonical coefficients associated with the variables measuring financial strength, the price-earnings multiple, one-year percentage change in price, and the degree of financial risk (leverage), the more likely that the firms be

classified as having high returns to total capital. To the contrary, for firms with higher timeliness ratings, higher values for Hamada's unlevered beta and the two-year growth rate, the more likely that the firm be classified as having low returns to invested capital. The canonical coefficients in table 2 indicate the strength of each explanatory variable in the discriminant function as well as their relative power to discriminate between the two groups. The canonical coefficients indicate that financial strength has the greatest contribution to the overall discriminating function followed respectively by Value Line's measure of timeliness, Hamada's unlevered beta, the price-earnings multiple, one-year percentage price change, the long-term debt to total capital ratio, and two-year forecasted growth rate. Thus, the findings are mixed, because, while three of these results were as expected, one had no a priori expectation and the other two were a mild surprise.

This study has a limitation in its scope in the sense that it did not investigate as to why the variables included in our study are associated with one group or the other, which could be an area for future research. Also, our findings and conclusions are so rich in their content that they will certainly lay down avenues for further research.

However, a few comments on the findings are in order. It was expected that Value Line's rating for financial strength and the price-earnings multiple to be the characteristics of firms with high returns to total capital. Similarly, it was also expected that the price-earnings multiple to be a characteristic of high-return firms as the multiple is considered a rough measure of market's perception of the value of companies. There was no a priori expectation regarding one-year percentage changes in price, as it was an unknown. However, the study had two mild surprises. First, although it is logical to expect the timeliness of investments to be a desirable characteristic and be associated with high returns to capital, but we found that the timeliness ranking was not associated with high returns to capital. Further, we expected growth to be interpreted as a return on investment, but we found no association of growth with group of firms reporting high returns to capital.

This study makes a significant contribution to existing body of knowledge in the field by offering a theory that associates firm's characteristics such as risk-return, financial strength, growth, and timeliness with the highest returns to total capital during a pandemic as reported by *Value Line* database. Since the model used in our study has been validated by data without any bias, it also contributes to the field of business and investment management by offering a tool to predict which firms may report a high return to total capital during market disturbances such as a pandemic or alike.

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